Versatile Tools: Gender Analysis and the History of Technology

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This volume introduces a new generation of historical scholarship. Historians of technology have long encouraged each other to find ways to broaden studies of technology: to incorporate women's experience as well as men's; to maintain historical understandings of context and contingency; to resist narrowing studies of technology to the machine shop or the drafting table. These articles pursue the implications of such prescriptions, making use of recent theoretical literature on gender to explore connections between technology and culture in ways not fully possible before.

Following such paths of inquiry makes clear this project's formidable scope. Gender ideologies play a central role in human interactions with technology, and technology in Western culture is crucial to the ways male and female identities are formed, gender structures defined, and gender ideologies constructed. Despite the pervasive importance of both gender and technology as parts of the human experience, scholars have only begun to explore their historical interrelationships. Seeking to facilitate a richer conversation about these issues, we address this introduction, and the historiographical essay following, to both historians of technology and scholars studying gender.

DR. LERMAN, DR. MOHUN, AND DR. OLDENZIEL are guest editors of this special theme issue. They wish to thank, first, the two editors of *Technology and Culture* under whose "batons" this issue has been orchestrated. Without Bob Post's encouragement it would never have been planned much less executed; John Staudenmaier's relentless belief in both clarity and substance has improved many an argument herein. Roz Williams agreed to the daunting task of reading all the articles early on; her collected comments were useful in planning this introduction as well. But neither this issue as a whole nor the work within it would be possible without the support and inspiration provided by a substantial thought collective. This introduction has benefited from comments by the following people: Naomi Abrahams, Lorraine Bayard de Volo, Julie Charlip, Paul Edwards, Christian Gelzer, Gabrielle Hecht, Sally Gregory Kohlstedt, Steven Lubar, Robert Post, Erik Rau, Eric Schatzberg, and John Staudenmaier.

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In this volume, gender is not a subject area; it is not just a fancy word for women's history. Studying gender and technology is not a question of counting female engineers, although that information may well be pertinent. Rather, gender is an analytical tool useful for making sense of culture, and thus for exploring the relationship between culture and technology. Gender can be defined in a number of ways, most generally as a set of ideas about maleness and femaleness and the shifting boundaries between them. As a number of the articles in this issue make clear, men as well as women have gender. Theorists describe gender as "relational," suggesting that the meanings of masculinity and femininity are continually being redefined through social interaction and with reference to each other. Gender can also be seen as a set of meanings attached to actions, things, and people. In addition to being part of individual identities and institutional structures, gender functions symbolically and metaphorically: to say that a particular technological activity is symbolically "gendered female," for example, does not mean that male people never participate in it.

Gender differences and ideologies do not "just happen." They are products of particular historical contexts; they are intentionally or unintentionally created by people. The articles in this volume suggest that creating and maintaining gender categories often requires an extraordinary amount of work. They also demonstrate how much is at stake in the process, whether that stake is access to technology and technological knowledge or control over the particular form of individual technologies and the trajectory of technological change. The common identification of technology as a masculine pursuit—"technology is what women don't do"[1]–must therefore come under scrutiny: such a definition is a particular product of a modern, Western cultural context.

In this volume, technology is not just a masculine pursuit. Neither is it synonymous with being "new" or "better," although progress ideologies are an important contributor to technological change in most industrial societies. Rather, as historians of technology have long maintained, technology must be defined broadly enough to encompass the full range of human experience, from chopping with stone tools to cooking in microwave ovens. As Mel Kranzberg suggested in the first issue of this journal, defining technology as " 'how

[1]Jan Zimmerman, ed., *Technological Woman: Interfacing with Tomorrow* (New York, 1983).

things are commonly done or made' and 'what things are done and made' " allows us to ask a further set of questions about the relationship between technology and culture, such as: "*Why* are things done and made as they are? What effects have these methods and things upon other elements of society? How have other elements in society and culture affected how, what, and why things are done and made?"[2]

Recent work in the history of technology and related fields has focused on the intersection of the last two questions, and has emphasized that human choices as well as technical constraints shape the invention, design, production, and use of technological artifacts and systems. Although their adoption may circumscribe or promote particular choices, artifacts and systems do not by themselves cause social change.[3] In recognition of the reciprocity of these influences, some scholars write about a "mutual shaping" of technology and society. Technology, like gender, is a construction situated firmly in cultural context.

Gender analysis, then, is a useful tool for exploring the history of technology for several reasons. If the traditional subjects of technology studies are identifiably masculine, then studying masculinity offers new perspectives on the cultural and ideological underpinnings of even the most familiar areas of the field, including engineering, technological systems, and invention. But further, and perhaps more importantly, gender analysis of "ways of making and doing things" challenges conventional assumptions about what is and is not "technology," and about which technologies are or are not important to study. Dismantling these traditional boundaries makes apparent the importance of exploring previously less obvious sites where technology and culture interact, such as sewing, butchering meat, or choosing a new household appliance.

[2]Melvin Kranzberg, "At the Start," *Technology and Culture* 1 (1959): 1–11, quotes pp. 8–9; Kranzberg was drawing on definitions used by Charles Singer, E. J. Holmyar, A. R. Hall, and Trevor I. Williams, *History of Technology*, 5 vols. (New York and London, 1954–58).

[3]Discussions of causality, choice, and determinism have a long history in the field. For highlights see Langdon Winner, "Do Artifacts Have Politics?" *Daedalus* 109 (1980):121–31 and *Autonomous Technology: Technics Out-Of-Control as a Theme in Political Thought* (Cambridge, Mass., 1977); Donald A. MacKenzie and Judy Wajcman, *The Social Shaping of Technology: How the Refrigerator Got its Hum* (Philadelphia, 1985); Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass., 1987); Wiebe E. Bijker and Trevor J. Pinch, eds., *Shaping Technology/Building Society: Studies in Socio-technical Change* (Cambridge, Mass., 1992); Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History?* (Cambridge, Mass., 1994).

But here again the relation is a reciprocal one: scholars interested in gender will gain new perspectives in their turn from attending to technology. To explore ways of making and doing things—including sewing, butchering meat, and choosing a new household appliance—is to explore a central aspect of the construction of gender systems. Technology is neither an esoteric nor a peripheral element of human experience. As several of these articles demonstrate, attention to technology can illuminate murky social questions, and highlight hidden boundaries. We suggest that both gender analysis and attention to technology can be versatile tools: the articles in this issue, despite their common themes, cover a range of diverse topics and reach sometimes disparate conclusions.

Many readers will already be acquainted with the historical context in the work presented here. The time frame is the 19th and 20th centuries; the location is largely North America. Many of the actors in these articles can be typed in familiar ways: engineers, businesspeople, children, home economists, industrial workers, domestic consumers. Likewise, the technologies are familiar: automobiles, needles and thread, washing machines, and factories. In short, these articles focus on industrial capitalism in the Western world during the last century and a half. Sources (though not necessarily the uses to which they are put) will also be familiar to historians of this period: trade journals, institutional reports, business records, advertisements, government documents, and personal papers. But in considering both the workings of gender identities and ideologies in shaping technology, and the role of technology in shaping ideas about gender, the familiar is illuminated in new ways.

Of course, focusing on the history of industrial capitalism has advantages that go beyond familiarity. First, although research in a variety of cultural and historical contexts is necessary to fully understand the many layers of gender and technology, using industrial capitalism as a starting point makes use of a wealth of existing literature in the history of technology and in gender studies. The tools of both fields have been most extensively developed to analyze this modern western context. Doing this kind of research on medieval Europe or on precolonial Africa would require a different integration of a different set of tools, and the probable invention of new tools: as historians, we are deeply aware that context matters.

Second, industrialization in the West has been a process in which historical actors themselves were aware of and attentive to both technological change and shifting social boundaries. Producing, maintaining, and thinking about technology in all its manifestations have been fundamental activities of industrialization; redefining basic as-

sumptions about work and family, childhood and adulthood has been an equally prominent theme. In the industrialized west, cultural change—like technological change—is a norm. Technological and gender systems, both as symbols and as material and structural reality, have been at the center of lived experience. The mutual shaping of culture and technology has been a central part of the process.

Moreover, industrial capitalism is a hierarchical social system in which identities such as gender and technological systems such as factories are central to the distribution of power and authority. In this context, the mutual shaping of technology and culture is partly a process of organizing and utilizing distinctions between groups of people. While these distinctions between people can be viewed as social structures undergirding society, these articles implicitly or explicitly reject an interpretation of culture as entirely structural.

On the other hand, these articles do not dismiss culture as superfluous window dressing, as a set of meanings that are a by-product of other activities. It is not, in other words, an amorphous cloud in which these stories take place. Instead, culture here describes a concrete as well as symbolic world. The institutions of industrial capitalism—whether schools or factories, households or showrooms—produce not only material artifacts, wealth, skills, and machines to make more artifacts, but also reproduce and reconstruct the social and cultural identities and relationships that characterize modern societies.

The articles that follow open the black box of these institutions to reveal how people, as individuals and groups, organize and deploy meanings to make sense of their changing material and social circumstances. All insist that agency in this process is vested in people. Several challenge common assumptions about who has agency and how that agency is exercised; they assert that individuals and social groups ultimately have agency in shaping technology, culture, and gender meanings and relationships. Thus the mutual shaping of technology and culture takes place through people—through a range of human relationships, including pairings such as engineer-corporation, child-educator, worker-employer, or producer-consumer, and distinctions based on categories of race, class, and gender.

Like other recent scholarship, the articles collected here also insist that such relationships must be viewed in reciprocal terms, and examined closely. Many scholars have found that thinking analytically about gender, about maleness and femaleness, leads them to reexamine other standard dichotomies: familiar pairs such as private and public, home and work, consumption and production have come

under scrutiny.[4] And it is no accident that, in each of those pairs, one member traditionally connotes "female" while the other connotes "male"—which means that standard taxonomies end up either camouflaging or essentializing the role of gender. This work of revisiting standard categories is also underway in technology studies, where attention to consumption as well as production has reframed industrialization, and attention to diffusion, use, or decline as well as invention has reframed technological change. In different ways, the articles gathered here take up these challenges, applying new tools to familiar examples, and in the process redrawing connections, making the implicit explicit, and, most importantly, exposing some of the fundamental dynamics of modern industrial society.

The article by Nina Lerman, " 'Preparing for the Duties and Practical Business of Life,' " explores the early history of these dynamics by focusing on the technical education of children in a mid-19th-century city. Close examination of what and how children were taught in educational institutions ranging from reform schools to technical institutes reveals tight links between social ideologies and ideas about technologies. Lerman insists that technological knowledge be defined as broadly as Kranzberg and others have defined technology. She argues that historically as well as in our own time different kinds of technological knowledge are valued hierarchically, in reciprocal relation with the race, class, and gender of the groups of people with whom they are identified. Indeed, clear evidence that educators and reformers concerned themselves with housewifery as well as with industry raises a much larger set of issues about the values assigned to technological knowledge by both historical actors and historians.

Ruth Oldenziel's article on the Fisher Body Craftsman's Guild also focuses on the socialization of children in industrial capitalism, but in the context of 20th-century mass production and mass consumption. For nearly four decades General Motors staged a nationwide model-building contest to teach and reward boys for becoming intellectually, emotionally, and physically involved in the production of automobiles. Meanwhile, GM's advertising campaigns portrayed girls as passive admirers of the models boys built. Oldenziel argues that the values ascribed to technological knowledge and to different kinds of interactions with specific technologies were no accident. Boys in 20th-century America didn't come to love cars because it

[4]For an overview of this trend see Gisela Bock, "Challenging Dichotomies: Perspectives on Women's History" in *Writing Women's History: International Perspectives*, ed. Karen Offen, Ruth Roach Pierson, and Jane Rendall (Bloomington, Ind., 1991).

was in their genetic code. They learned to be technophiles because extensive cultural resources were mobilized to inculcate that affection. In working to construct a new consumer world, GM cast boys and girls in marked and opposite roles as knowledgeable builders and passive consumers.

Like Oldenziel, Arwen Mohun demonstrates the enormous and persistent effort that has historically gone into assigning gendered qualities to certain technologies. The principal actors in Mohun's article are a more modest group of businessmen—the male owners and managers of commercial laundries in England and the United States. Because laundrywork had long been gendered female, laundrymen (as they called themselves) felt compelled to argue for the essential masculinity of their roles in order to preserve their authority, status, and customer base. Using trade journals and other sources, Mohun describes the process through which the "laundrymen" used broader cultural notions about the link between gender and technology to argue for the essential masculinity of their role despite its feminine associations. Through her use of comparative analysis, Mohun also explores the different ways that masculinity and technology are linked on either side of the Atlantic.

The home economists in Carolyn Goldstein's "From Service to Sales" were also trying to make a place for themselves by manipulating the gendered cultural meanings of technology and technological knowledge. In the 1920s and 1930s, they created a role as mediators between the masculinized world of energy and appliance production and the female realm of domestic consumption, teaching housewives how to use new kitchen appliances. Professional home economists working for utility companies thus stood at what Ruth Schwartz Cowan has called the "consumption junction." This approach highlights the interaction of ideas about gender and technology, and emphasizes the importance of analyzing consumption and production as part of a single process.

In her article on consumers and washing machines in 20th-century Canada, Joy Parr also links consumers and producers into an active process of shaping technology. In Canada, consumers favored wringer washing machines over automatic ones well into the 1950s, leaving manufacturers puzzled over this seemingly illogical rejection of a "better" technology. What the manufacturers failed to realize, Parr argues, was that Canadian consumers assessed the value of different kinds of washing machines partly in terms of how they fit into the technological system of the home. Limited supplies of electricity and water made the long cycles and multiple rinses of automatic machines look wasteful rather than efficient. Rather than being pas-

sive recipients of male producer's ideas of what makes a "good" technology, female consumers of household appliances made rational economic decisions. Parr vividly illustrates how male producers became so attached to particular ideas about technology and to an imagined female consumer—which they constructed along with their machines—that they lost sight of the real families making purchasing decisions.

Indeed, the expectations raised by traditional gender ideologies are not infrequently at odds with the more structural ways gender can function. Roger Horowitz, exploring gender and racial divisions of labor in 20th-century American meatpacking plants, finds that symbolic associations attached to gender and race, such as white women's purported cleanliness, had little to do with where different workers could be found working. Instead, women were hired for jobs that were off the main production track, such as slicing bacon and making sausage. They also could be found in places where, as the title of his article suggests, men would not work. Horowitz pushes us to think about factories as technological systems whose layers ranged from the building itself to the knives used by some of the workers, all of which were culturally as well as technically functional. His analysis provides another example of how attention to technology can be a tool for understanding the complex ways gender is constructed.

As all these articles demonstrate, analytical attention to traditional taxonomies requires sustained effort. Analysis of embedded cultural assumptions is likely to redefine the boundaries of objects, economic categories, and notions of creation. Work begun in this vein raises questions about where the technical artifact or product begins or ends, where or whether the divide between production and consumption should be drawn, what constitutes "invention" and "use." Further, this kind of analysis suggests we pursue the parallels between gender and technology as human constructs: we know much about technology as structure and institution, but far less about technology as part of Western cultural identity, or technology as site of multiple meanings, symbols, and ideologies. Gender analysis is just a beginning—albeit a crucial one—for a new kind of exploration of technology and culture.